THE USE OF GEOGRAPHICAL INFORMATION SYSTEMS TO LOCATE WILD *P. vulgaris* IN HONDURAS

Steve Beebe[1], Aracelly Castro[2], Federico Rodriguez[3], Oswaldo Varela[2] and Peter Jones[1]
[1]CIAT, Cali, Colombia; [2]Escuela Agrícola Panamericana (EAP), Zamorano, Honduras;[3]Secretaría de Recursos Naturales, Tegucigalpa, Honduras.

The wild ancestor of the cultivated common bean is distributed from Chihuahua in the north of Mexico to Salta in the north of Argentina, at altitudes from 800 to 2000 masl. Its occurrence within this broad geographical range is a function of ecological factors, especially patterns of rainfall and temperature, that define the vegetation type. These factors are quantifiable parameters that lend themselves to statistical analysis, given the existence of databases of sufficient size and breadth. The present exploration was undertaken to test a model that was developed to predict the occurrence of wild bean, based on an application of Geographical Information Systems (GIS) and utilizing these climatic parameters.

Development of the model

A full description of the GIS model is reported elsewhere (Jones et al, in press). Briefly, known collection sites of wild bean were identified. In the present application, collection sites in Guatemala, El Salvador and Costa Rica were used. Twelve monthly averages for the parameters of temperature, diurnal temperature difference and average rainfall were estimated for these sites. Estimates of climatic parameters were based on data from surrounding meteorological stations and adjusted for altitude. These estimated "climates" were then subjected to a Principal Components Analysis together with climates for all other environments in the target area, so as to identify other climates that were similar to those known to harbor wild bean. Results were calculated as a relative probability of the existence of wild bean in a given area and mapped. Our original calculations and maps were based on a mapping unit or "pixel" of 18 km square, but in the case of Honduras it was possible to implement for the first time a map of 1 km square pixel.

Exploration for wild bean

As long ago as the 1940's, wild *Phaseolus vulgaris* was reported and herbaria samples were obtained in Honduras by Paul Standley (Burkhart and Brucher, 1953). More recently, a botanist in the EAP had taken more herbaria, but no seed had been collected, nor was the extent of wild bean populations known.

It was not possible in the time available to make a systematic and exhaustive collection. Our purpose was rather to test how well the map was predicting wild bean environments. Hence we visited several regions quickly in the second week of December, 1996, to see what sort of vegetation was being picked up by the model.

Once in the field, it was apparent that some areas corresponded well to the wild bean environment, and the map in fact led us to wild bean populations. In other cases there was a large discrepancy. Upon returning to Colombia the data input was reviewed and a significant error was found in the formatting of data. Although unfortunate, this error and the faulty map led us to explore both regions of high probability and nearby regions of low probability, thus testing the model at both extremes of its predictions. When this error was corrected, the revised map (Fig.1) fit the reality that we found in the field very well in almost all cases.

Wild beans were collected in four different regions in Francisco Morazán and El Paraíso departments, three of which were indicated as high probability by the map. A total of 10 wild or weedy populations were identified. These collections included both wild *P vulgaris* and wild *P coccineus*, the existence of the latter in Honduras of which we were previously unaware. In fact, many populations of escaped *P coccineus* were observed, and the wild coccineus was hybridizing freely with the cultivated type. Weedy coccineus was observed in abundance in two regions.

Based on the growth cycle of wild bean in Guatemala, El Salvador and Costa Rica, one would have expected that the wild beans in Honduras would be mature and perhaps shattering and losing their seed at this time of year. In fact, many populations were still quite immature. Farmers reported that they would normally be ready for harvest in mid-January.

Other regions remained to be explored more fully or for the first time: in Francisco Morazán department, in the north around San Quin and around San Marcos, and in the west between Guadalupe and Aguanqueterique in La Paz department; in El Paraíso department, in the west around San Lucas; in the far west of Honduras, to the southeast of Nuevo Ocotepeque near the border with El Salvador; and regions of slightly lower probability in Olancho and El Paraíso departments.

References:

Jones, P G, N W Galwey, S E Beebe and J Tohme. 1997. The use of Geographical Information Systems in biodiversity exploration and conservation. Biodiversity and Conservation (in press).

Burkhart, A von and H Brucher. 1953. *Phaseolus aborigeneus* Burkhart die mutmaßliche andine Staminform der Kulturbohne. Der Züchter 23 (3): 65-72. 30 refs.

Figure 1: